

SUPPORT FOR THE AMENDMENT

This Amendment cancels Claims 2-13; and adds new Claims 14-24. Support for the amendments is found in the specification and claims as originally filed. In particular, support for Claim 1 is found in Claim 1-2 and 13, and in the specification at least at [0032]. Support for new Claim 14 is found in the specification at least at [0035]. Support for new Claim 15 is found in the specification at least at [0009] ("CVD method"); [0019] ("for the source material ... ruthenium dipivaloylmethanate"); [0034] ("specifically by setting conditions in which the oxygen content percent of the carrier gas is greater than 9% and less than 23% and the temperature of the substrate is 350 ~ 450°C, it is possible to disperse ruthenium metallic fine particles as crystalline fine particles in a matrix having carbon as a main component"); and [0056] ("matrix in which carbon derived from the source material is made a main component"). Support for new Claim 16 is found in canceled Claim 3. Support for new Claims 17-21 is found in canceled Claims 5-9, respectively. Support for new Claims 22-23 is found in canceled Claim 11. Support for new Claim 24 is found in canceled Claim 12. No new matter would be introduced by entry of these amendments.

Upon entry of these amendments, Claims 1 and 14-24 will be pending in this application. Claim 1 is independent.

REQUEST FOR RECONSIDERATION

Applicants respectfully request entry of the foregoing, and reexamination and reconsideration of the application, as amended, in light of the remarks that follow.

The present invention is related to a particle-dispersed complex in which fine ruthenium particles are dispersed in a carbon matrix. The complex can serve as a very active electrochemical catalyst used as the sensor electrode of a solid electrolyte sensor or as the electrode of an electrochemical device. Specification at [0001], abstract.

Claims 1 and 3-5 are rejected under 35 U.S.C. 102(b) over U.S. Patent No. 6,471,745 ("Foley"). Foley discloses catalytic membranes comprising Ru particles having diameters less than 5 nm dispersed in ***nanoporous*** carbon membranes. Foley at abstract; column 30, lines 12-17.

However, Foley is silent about the ***non-porous*** complex featured in independent Claim 1. In particular, Foley fails to suggest the independent Claim 1 limitations of "a matrix having carbon as a main component; and metallic **ruthenium particles** dispersed in and **surrounded by** the matrix, wherein ... **every part of the entire surface of each of the particles makes contact with either the matrix or another of the particles**". Thus, the rejection over Foley should be withdrawn.

Claims 1-3 are rejected under 35 U.S.C. 102(b) over "Evaluation of Precursors for Chemical Vapor Deposition of Ruthenium", *Thin Solid Films*, 376, 73-81 (2000) ("Smith") with evidence from "Electrochemical Properties of Iridium-Carbon Nano Composite Films Prepared by MOCVD", *Scripta Materialia* 44, 1187-1190 (2001) ("Goto") and "Preparation of RuO<sub>2</sub>-YSZ Nano-Composite Films by MOCVD", *Surface and Coatings Technology*, 167, 240-244 (2003) ("Kimura"). Claims 6-11 are rejected as obvious over Smith in view of Goto. Claims 12-13 are rejected as obvious over U.S. Patent No. 7,097,875 ("Clyde") in view of Smith and Goto.

Smith discloses deposition of pure ruthenium films using MOCVD and organometallic precursors. Smith at title; abstract. Smith discloses that without oxygen in the reaction gas, significant amounts of carbon were incorporated into the ruthenium films. Smith at abstract; page 78, column 1. Smith discloses that for Ru film grown on Si<sub>3</sub>N<sub>4</sub>, "thermodynamic driving forces favor three-dimensional Ru particle growth".

However, Smith is silent about Ru particles dispersed in and surrounded by carbon and about the size of such Ru particles.

Goto discloses that "carbon can prevent the grain growth of noble metals" and that "[t]his leads to the formation of noble metal nano-particles ...". Goto at abstract. Goto also discloses "**Ir** crystallites (**1 to 3nm in dia.**) are surrounded by amorphous carbon". Goto at page 1188.

Kimura discloses composite films consisting of RuO<sub>2</sub> and yttrium stabilized zirconia (YSZ) particles. Kimura at abstract.

The Office Action cites Clyde against dependent Claims 12-13 for disclosing a solid electrolyte sensor. Office Action at section 5, lines 4-5.

However, the cited prior art fails to suggest the independent Claim 1 limitations of "a matrix having carbon as a main component; and **metallic ruthenium particles** dispersed in and surrounded by the matrix, wherein each of the particles has a **particle diameter** in a range of from **5 to 100 nm**". Thus, the prior art rejections should be withdrawn.

Claims 2 and 13 are rejected under 36 U.S.C. 112, second paragraph. To obviate the rejection, Claims 2 and 13 are canceled, and independent Claim 1 is amended to recite "particles ... surrounded by the matrix, wherein ...every part of the entire surface of each of the particles makes contact with either the matrix or another of the particles".

In view of the foregoing amendments and remarks, Applicants respectfully submit that the application is in condition for allowance. Applicants respectfully request favorable consideration and prompt allowance of the application.

Should the Examiner believe that anything further is necessary in order to place the application in even better condition for allowance, the Examiner is invited to contact Applicants' undersigned attorney at the telephone number listed below.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,  
MAIER & NEUSTADT, P.C.  
Norman F. Oblon



---

Corwin P. Umbach, Ph.D.  
Registration No. 40,211